Open-data platform and analysis DTU Smart Campus

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I. Introduction

For learning and research about more sustainable buildings logging of data such as energy on sub-levels, indoor climate and weather is required. Building management system samples data for control of building installations, but these are proprietary and access is not possible for students and research. In this on-going work is presented the necessary steps needed for Smart Campus Platform design using none intrusive IOT sensors implemented by students and answer and discuss this question: How to utilise the energy- and indoor climate data by using this platform in data analysis and how to extract knowledge about the energy consumption on component level?

II. Smart building data platform

Studies show that awareness of energy consumption in private homes[1] and office buildings[2]can be increased by logging, analysing and visualising data.

Currently, we are logging data from: parking space smart lights, electrical meters, weather stations and indoor climate meters. The platform fits well with the monitoring and analysis of energy management as described in ISO 150001 [3] [4].

Last year, three Bachelor of Eng. students [5] configured the platform and developed the back-end and front-end as well as the sensor database. The data platform was developed as a tool for Sustainable Production in Work-Package 4[1]

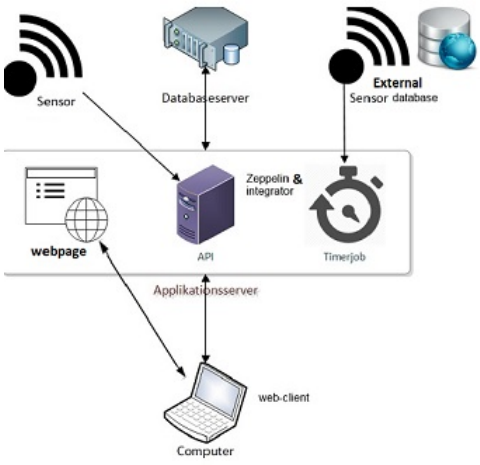

Figure 1. The data analysis domain model

The domain model for the platform is shown in Figure 1: where sensor-data from external databases are by timer-jobs aggregated into a common MYSQL-database from where the Zeppelin[6] notebook can access data by e.g. scripts in R, Python for analysis and visualisation.

III. Perspectives

Furthermore, the following perspectives will be presented and discussed at the conference: the potential for and objectives in cooperating with industry and undertaking CDIO[2]-projects. The platform is going to be used in a new research project ESNAP data-driven energy-screening funded by the Danish Energy Agency, 2018. One of the outcomes of the ESNAP project during the next 1.5 year should lead to models for different installation parts based on energy measurements. Future projects will also include visualisation of data for nudging studies[1].

IV. Engaging the audience

The poster will be printed on paper and placed in an appropriate location. The presentation of the contents will take 5 minutes. Then I will pose 3 questions to the audience.

A. What could you imagine students using this data for?

1) Write keywords on post-it for 2 minutes
2) Place the post-its on the A2 paper next to the poster
3) Present your ideas for 1 minute

B. How can energy-data be presented so it makes an impact on the people present?

1) Write keywords on post-it for 2 minutes
2) Place the post-its on the A2 paper next to the poster
3) Present your ideas for 1 minute

C. What ideas do the poster and the keywords suggest to you?

1) Create a mind map together on another A2 paper for 8 minutes about the research questions raised.

[1]funded project by The Danish Industry Foundation

[2]Conceive Design Implement and Operate

V. Remarks

If the audience is to be active it requires at least 20 minutes. However, it could be interesting just to have a paper next to the poster, enabling participants passing by to give comments and suggestions. A shared online document would be relevant as well. I would like to give a demo using the data-platform and zeppelin.

References

[1] Safdar Ali and Dohyeun Kim. "Visualization methodology of power consumption in homes". In: *ICOSST 2013 - 2013 International Conference on Open Source Systems and Technologies, Proceedings*. 2013. ISBN: 9781479920464. DOI: 10.1109/ICOSST.2013.6720606.

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[3] Danish Energy agency. "Energy Policy Toolkit on Energy Efficiency in Industries Experiences from Denmark". In: (2015).

[4] Consultancy Ramboll. *Data to Energy Efficiency and Flexible Energy Consumption in Buildings*. 2017. URL: https://ens.dk/sites/ens.dk/files/Energibesparelser/data_ee_fleksibelt_energiforbrug_bygninger_ramboell.pdf.

[5] Hakan Yurdakul Pedersen - S133835 Nicklas Ejberg Storm Jensen - s135274 Abdirazak Mohamud Yusuf - S130599. *Data Samling*. 2017.

[6] Nov. 2017. URL: https://zeppelin.apache.org/.